VOL. 10, NO. 23, DECEMBER 2015 ISSN 1819-6608
ARPN Journal of Engineering and Applied Sciences


www.arpnjournals.com

WEB USER INTERFACE: LOCAL WEBSITES VERSUS USERS' MENTAL MODEL PATTERN FOR ASEAN

Aslina Baharum[1,2] and Azizah Jaafar[2]
[1]Faculty of Computing and Informatics, Universiti Malaysia Sabah, Sabah, Malaysia
[2]Institute of Visual Informatics, Universiti Kebangsaan Malaysia, Selangor, Malaysia
E-Mail: aslinabaharum@gmail.com

ABSTRACT

Even though there is a great development of mobile application nowadays, a web-based platform is still the necessary development for accessing information. The web interface is an important part of a web structure or web layout of a website which captures the users' eyes at first glance, whether it is appealing and expected or not. Do the developers or designers develop the web user interface (UI) based on users' mental model pattern (uMMp)? Or do they realize that experienced and knowledgeable users may have an expected look of the layout or in particular, the localization of the web objects? Every user may have different expectations of the same website, but it may be significantly different when compared to users from other countries. This study will compare and identify the ASEAN uMMp UI with the UI of popular websites in the Association of Southeast Asian Nations (ASEAN). The aim of the study is to prove that the users may have created their own mental model pattern when looking at a website. This result can hopefully inspire other designers or researchers of the usefulness of web development based on uMMp for web design development improvement in the future.

Keywords: user mental model pattern, user-interface, guideline, web object.

INTRODUCTION

The Web is one of the most revolutionary technologies that changes the business environment and has a dramatic impact on e-commerce [1]. Websites often provide the first impression of an organization. For many organizations, websites are important to ensure information, sales, or obtain services. When a person opens a website, the first impression is likely to be made within a few seconds and the user will either stay or move on to the next site based on many factors [2].

According to [3], professional designers generally agree that well-designed UIs improve web performance and appeal, helping to convert "tourists" or "browsers" to "residents" and "customers." The UI development process focused on understanding the users and acknowledging demographic diversity. But in a global economy, this may reflect cultural differences around the world. Companies that want to conduct international business on the Web should take into account the impact of cultural understanding and using web-based communication, content, and tools [3].

Robbins and Stylianou [4] suggested that developing an effective multinational Internet presence requires designing websites that operate in a diverse multicultural environment. Globally accessible websites also have the potential to inform and include various countries all over the world in large-scale information sharing to mitigate any effect of exclusion. This study is an initial contribution related to the design characteristics, hence preferences that prevailed in ASEAN. The investigation showed that there were significant differences between website designs of the 10 countries examined. However, the small differences extended into three uMMp, which were derived from previous research [5,6]. In addition, the Web requires interface characteristics suitable for culturally diverse audiences.

BACKGROUND

Research on mental model theory is wide in any field and it was first mentioned by [7] in his book titled "The Nature of Explanation" [7, 8]. Later, Johnson-Laird has proposed MM as a way of describing a process. His theory involves a set of diagrams to explain various combinations of premises and probable conclusions [8, 9]. He has also formulated the idea of mental model on a space object. Based on this idea, [10] and [11] applied the mental model into human-computer interaction (HCI) adopted to design the interface or interaction methods that help people build a more accurate model for their mental systems.

As the localization concept has recently gained the attention of researchers due to the potential across cultural and national boundaries, many issues remain unanswered and yet to be explored. One of the key issues is the localization methods using mental model for the interface design of a good website. At the same time, it should be able to accommodate a variety of user satisfaction with the country's diversity and cultural areas. Various proposals and other methods are available in the literature to address the issue of interface design, namely multicultural design. However, most of the literature have focused on the set of general issues of Hofstede and Hall's cultural dimensions rather than the mental model using localization.

Localization methods focusing on the interface of web objects used in this study are named as LWO. LWO is the location of objects in relation to users' expectations of the web interface layout that created uMMp and adapted into a framework of conceptual design for website

interface. Based on previous studies, geometric grids are used as the localization of web objects, but have been modified based on the suitability of a case study with 7 x 6 vertical and horizontal grid squares, namely geometric 42 grid squares as a mock web browser.

METHODOLOGY

Web Objects

Every feature or object has an important ranking based on the users' purpose and the type of the website either informational website, e-commerce, library website, or general website. 10 web objects were selected as a sample study; Logo, Title of web page, Internal links, External links, Search engine, Login, Language selection, Content (area), Calendar, and Advertisement (banner). Table-1 describes each object in detail.

Table-1 Operational Definition of Web Objects.

Web object	Operational definition	Source
1. Logo	The introduction of an organization, company, or brand.	[12-14]
2. Title of webpage	Banner title of the website. It is used to identify and provide information on this website.	[13, 15]
3. Internal links	The main menu or the links that go from one page to another page on the same site (e.g., "Home").	[13, 15, 16, 17, 18]
4. External links	Useful links or links to other web pages pointing to a page on different sites.	[15-17]
5. Login	It is used as part of the website (including user profile and others) to track users and security features, data, and information.	[12, 14, 19, 20]
6. Language selection	Feature to enable the user to choose another language.	[21-25]
7. Search engine	Helps users locate information within and/or outside the site.	[12, 13, 14, 15, 16, 18, 19, 20, 26, 27, 28]
8. Content (area)	Contains information, products, and/or content links.	[22, 29, 30, 31]
9. Calendar	List of news/events in calendar form or links.	[32]
10. Advertisement (banner)	A graphic image used on websites to promote products or services.	[13, 15, 16, 17, 18, 20]

Empirical Studies of User Mental Models

A study was performed for ASEAN users' mental model pattern using localization of web objects. The study was conducted in three phases; (i) a total of 50 participants were involved from May 2012 until September 2012, (ii) a total of 94 participants gathered by the end of 2012, and (iii) additional data collection for two months in August and September 2013 with 110 participants. With an increase in the sample size, more informed decisions were obtained.

There were three phases of data collection to get accurate results and see the common preferences among the ASEAN users. According to [33], the data collection from multiple samples is necessary. Therefore, the problem of bias can be reduced and the overall results can be improved. The sample includes new and experienced website users. In the first phase, participants involved a group consisting of the director and staff members of the ASEAN Center for Biodiversity (ACB), and representatives from each ASEAN country which are the web designers, data managers, and project director of the country's biodiversity. The second phase involved the ASEAN users of two different groups; (i) the site of the country's biodiversity or ACB, which consists of experts in the fields of biodiversity and databases, scientists, researchers, rangers, forestry, and botany, and (ii) common users chosen at random for each country from different fields. Finally, the third phase is additional participants consisting of ASEAN users from a training workshop held in Japan. The group consists of experts and researchers from the biodiversity field of information systems. Data collection was done in two ways; (i) online via email, and (ii) face-to-face through workshops, conferences, and seminars.

A total of 110 participants from different professions whom are representatives of state and local 10 ASEAN members, which comprises 10 countries, namely Brunei, Burma, the Philippines, Indonesia, Cambodia, Malaysia, Lao PDR, Singapore, Thailand, and Vietnam have completed a study related to the expectation of the location of objects for the informational websites. Figure 3.3 shows the distribution of participants from different countries. Some 71% of participants aged over 30 years with an average age of 33 years (range: 18 to 58 years); 70% were males and 40% were females. In addition, 94% said they used the computers daily. Almost all participants reported using English as the language of instruction or second language. This shows that the majority of skilled and semi-skilled players understand the websites in English language. The main requirements are the two criteria for participants; (i) must be permanent residents or citizens of ASEAN, and (ii) must be computer literate with experience of surfing the Web for more than three years.

Results

The frequency of the participant selection was obtained by adding the number of each selected object on a grid and representing the selection frequency in different colors as shown in Figure-1. The frequency represents the

number of times each square was chosen as the expected location of a particular web object. Figure-2 shows the mock browser (7 x 6) of the geometric 42 grid squares to facilitate the location of each object in this study.

Figure-1. The darker the color, the more frequent the selection.

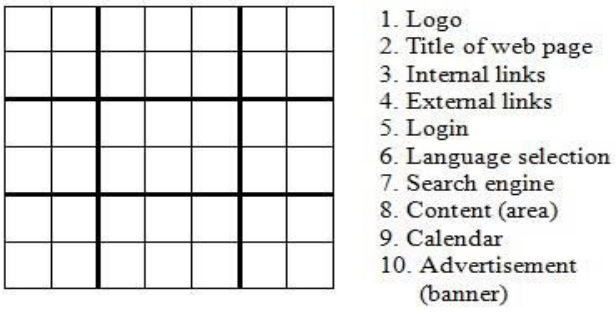

Figure-2. Overview browser window (showing 42 grids).

The three ASEAN uMMp obtained (Figure-3 to Figure-5) are Layout 1 preference for six countries (Lao PDR, Brunei, Singapore, the Philippines, Myanmar, and Vietnam), Layout 2 for two countries (Malaysia and Indonesia), and Layout 3 for another two countries (Thailand and Cambodia).

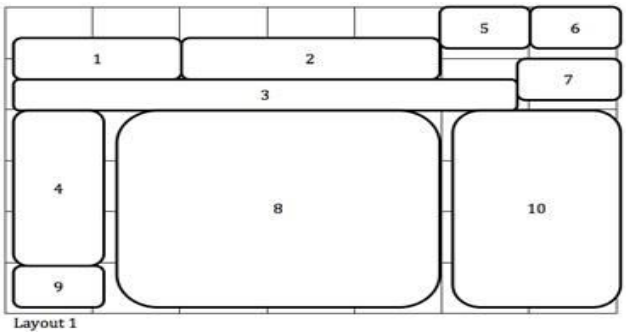

Figure-3. The ASEAN uMMp for Layout 1.

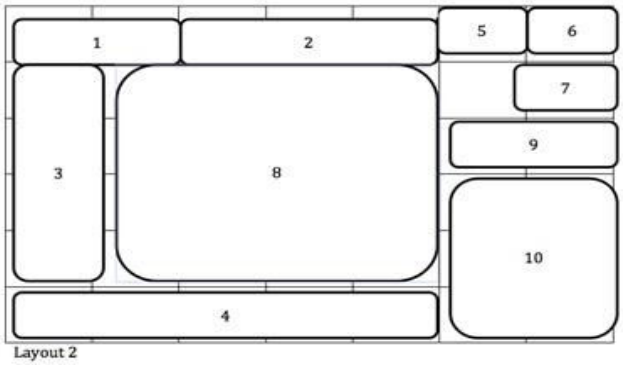

Figure-4. The ASEAN uMMp for Layout 2.

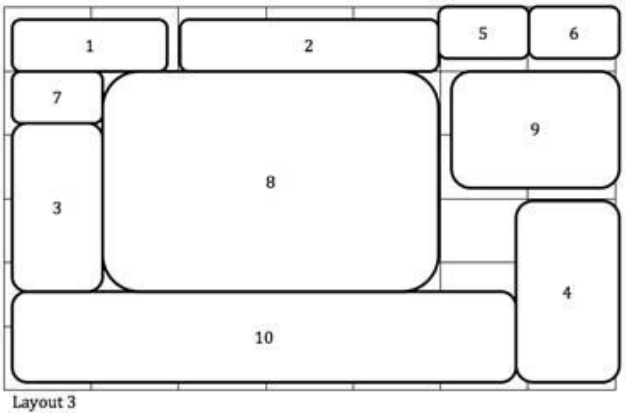

Figure-5. The ASEAN uMMp for Layout 3.

Content Analysis

This study is continuity from previous studies [5, 6]. Content analysis was applied across ASEAN with the 10 web objects. Five to six UIs of popular websites for each country were examined and compared with the three ASEAN uMMp. The popular websites were selected based on the top ranking according to Alexa Internet as at October 23, 2012 (Figure-6a to 15a). Alexa ranks websites based on a combined measure of page views and unique site users. The popular website ranking was based on the popular websites obtained in the category of informational websites. Popular websites mean the high ranking of websites that people frequently visit or browse. This can be summarized as an acceptance by users or might have a high value for users.

RESULTS AND DISCUSSION

Based on the results shown (Figure-6 to Figure-15), at least 40% from the 10 ASEAN popular websites followed the ASEAN uMMp from the previous results [5, 6]. This shows that all the countries are significant and proves that there is a uMMp in information searching. Brunei (90%), Singapore, and Vietnam (80%) have the highest significance with the ASEAN uMMp, followed by Malaysia, Myanmar, the Philippines, and Thailand with 70% similarity. Finally, Indonesia and Lao PDR with 50% each, and Cambodia (40%). However, the Philippines and Singapore did not have the language selection object on their websites.

The ASEAN uMMp was made as standard guidelines for the website development. This is to ensure that UI design that was developed met the recommendations by previous researchers for a good UI design [20, 34]. The UI design is necessary to ensure a good interface complies with the guidelines for multicultural interface requirements that can be applied to a variety of users with different demographics and not only a mono-cultural interface [20].

When users look and search for information on the Web, without realizing they create a mental model pattern, either at the center, on the right, on the left, or

bottom area. The valuable mental model pattern is from the experienced and knowledgeable users who are already indirect or not influenced by various websites worldwide. According to [35], the areas the users will look at the most while browsing start from the center area to the left side, on top, and finally to the bottom parts.

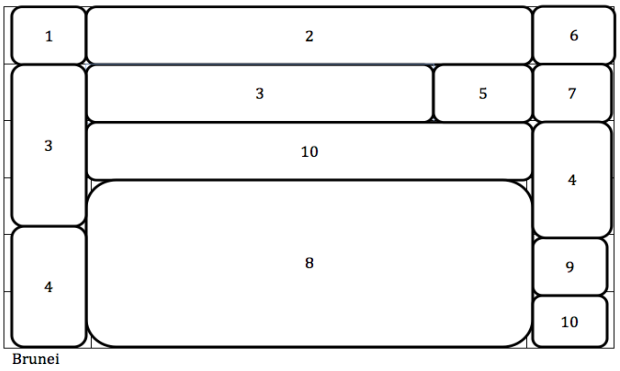

Figure-6(a). Localization from popular Brunei's websites, 90% (except 9).

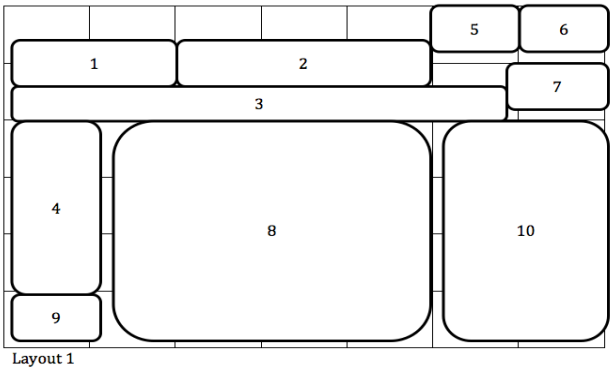

Figure-6(b). Expected location of Brunei.

*Note: bruneiweather.com.bn, isb.edu.bn, stgeorges.edu.bn, ubd.edu.bn, ji.edu.bn, standardchartered.com, pmo.gov.bn, bruneiair.com

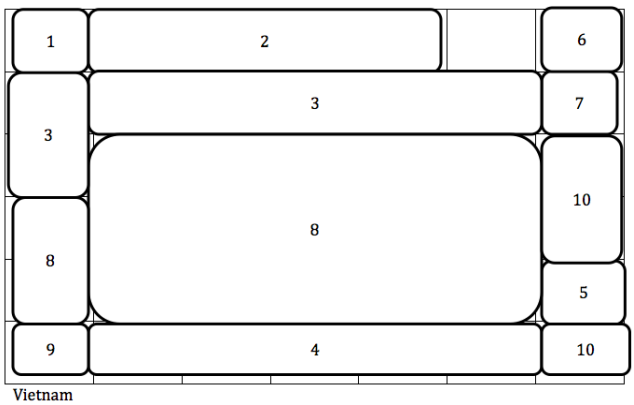

Figure-7(a). Localization from popular Vietnam's websites, 80% (except 4, 5).

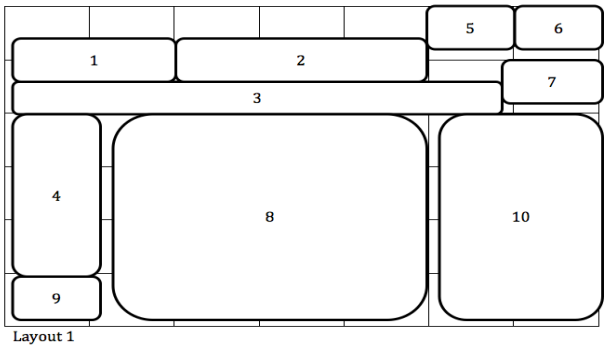

Figure-7(b). Expected location of Vietnam.

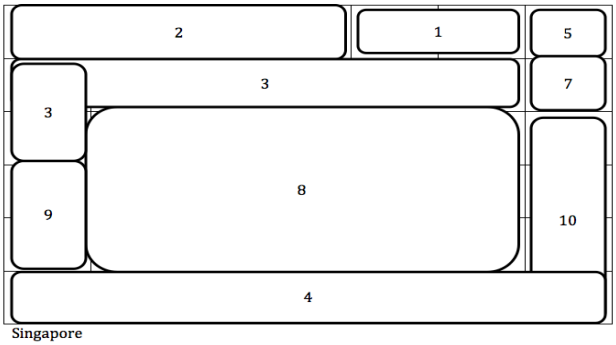

Figure-8(a). Localization from popular Singapore's websites, 80% (except 1, 4).

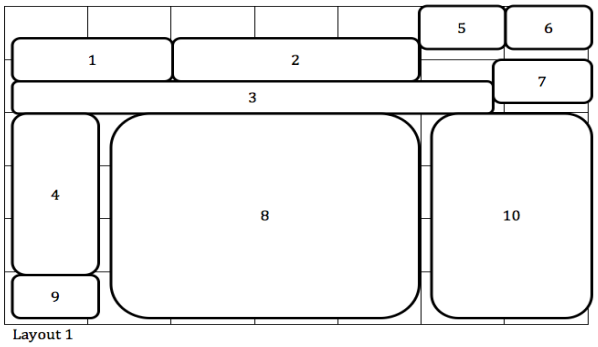

Figure-8(b). Expected location of Singapore.

*Note: gov.sg, business.gov.sg, career.gov.sg, ecitizen.gov.sg, cnsg.com.sg, nparks.gov.sg, rsi.sg, ifscapital.com.sg

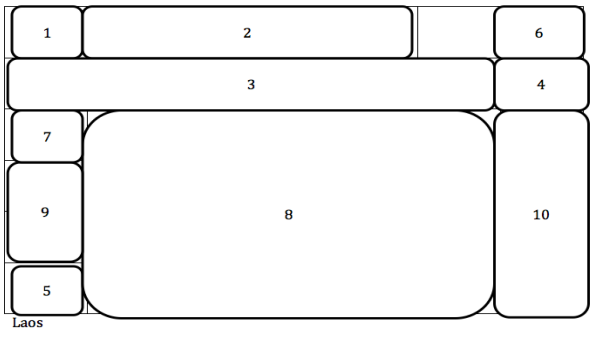

Figure-9(a). Localization from popular Laos's websites, 70% (except 4, 5, 7).

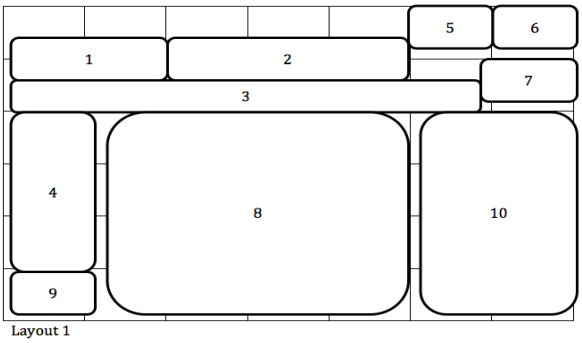

Figure-9(b). Expected location of Laos PDR.

*Note: kupo.la, na.gov.la, nsc.gov.la, moc.gov.la, nuol.edu.la, mofa.gov.la

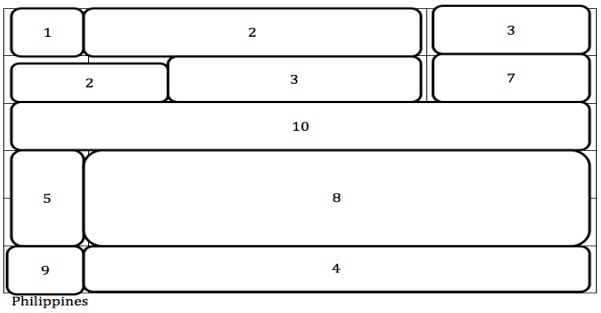

Figure-10(a). Localization from popular the Philippines's websites, 70% (except 4, 5, 10).

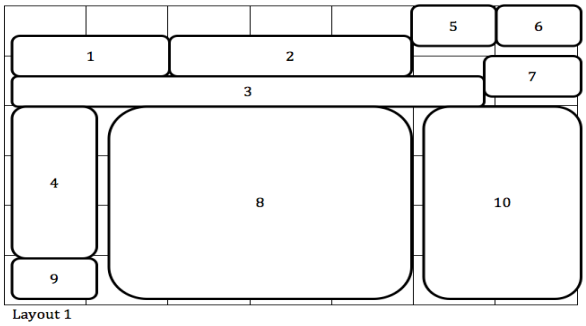

Figure-10(b). Expected location of the Philippines.

*Note: da.gov.ph, gov.ph, webdc.com.ph, webfocus.ph, Mobius.ph, supercat.com.ph.

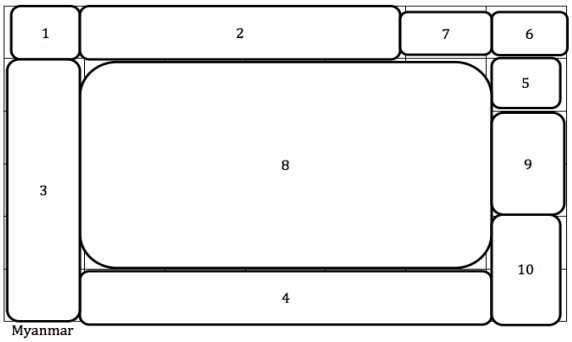

Figure-11(a). Localization from popular Myanmar's websites, 70% (except 3, 4, 9.

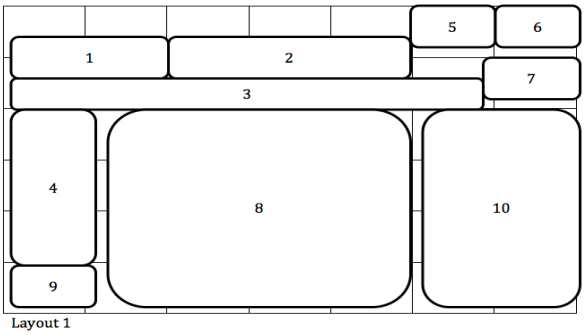

Figure-11(b). Expected location of Myanmar.

*Note: umfcci.com.mm, planet.com.mm, ummg.edu.mm, mpt.net.mm, mofa.gov.mm, energy.gov.mm.

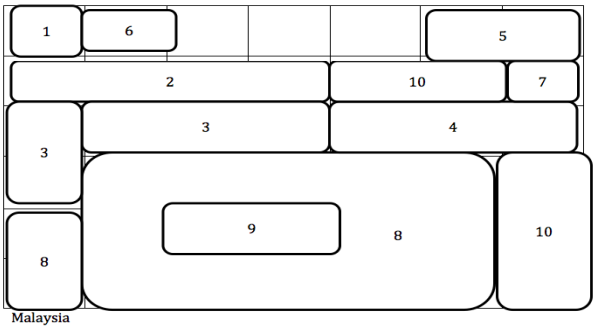

Figure-12(a). Localization from popular Malaysia's websites, 70% (except 4, 6, 9).

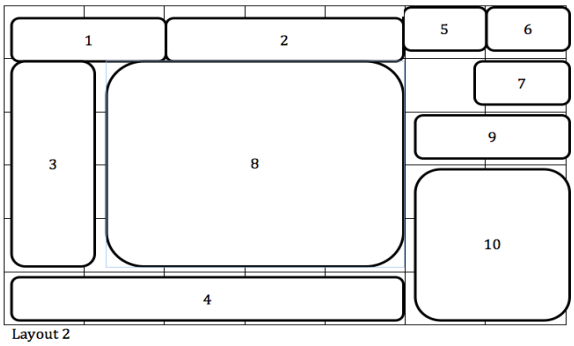

Figure-12(b). Expected location of Malaysia.

*Note: thestar, malaysiakini, maybank2u, airasia, jakim, moe.gov, umcc.com, tourism

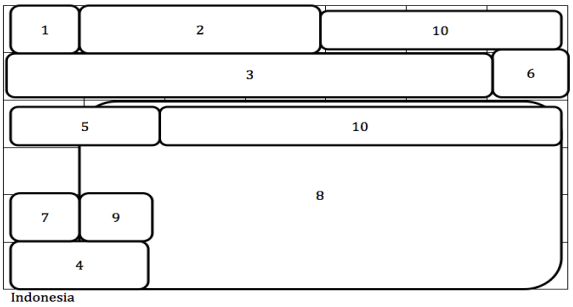

Figure-13(a) Localization from popular Indonesia's websites, 50% (except 3, 5, 7, 9, 10).

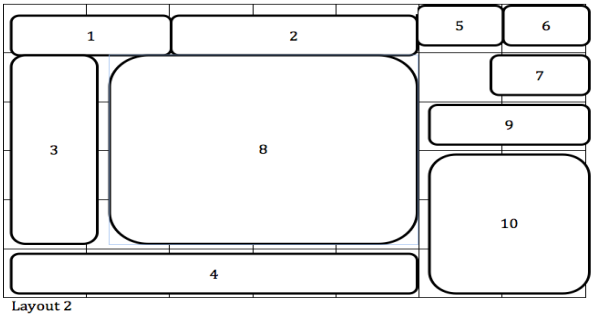

Figure-13(b) Expected location of Indonesia.

*Note: indopos.co.id, lead.or.id, its.ac.id, indowoodenfurniture.co.id, terranet.or.id, Batavia-air.com.

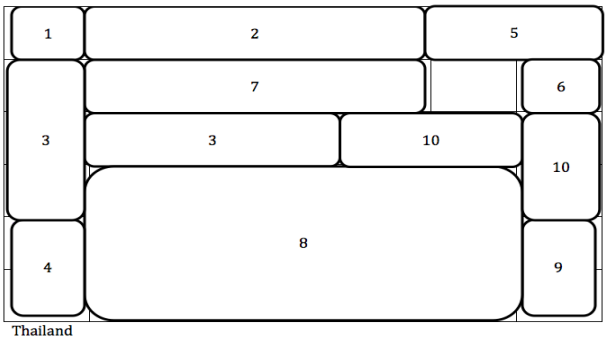

Figure-14(a) Localization from popular Thailand's websites, 70% (except 4, 9, 10).

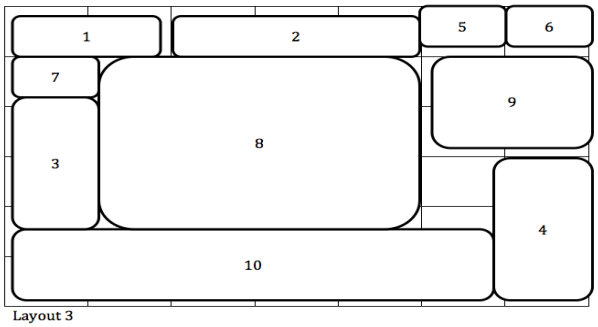

Figure-14(b) Expected location of Thailand.

*Note: obcc.go.th, moe.go.th, gprocurement.go.th, thaigov.go.th, thairath.co.th, manager.co.th, dailynews.co.th, vec.go.th

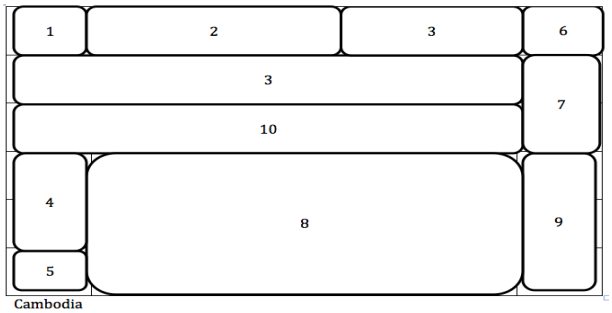

Figure-15(a) Localization from popular Cambodia's websites, 40% (except 3, 4, 5, 7, 9, 10).

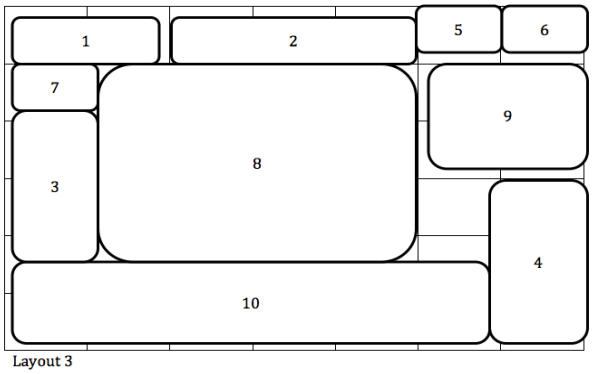

Figure-15(b) Expected location of Cambodia.

*Note: phnompenh.gov.kh, mptc.gov.kh, nida.gov.kh, aii.edu.kh, nis.gov.kh, cnm.gov.kh.

CONCLUSIONS

This study provides the evidence to support the work of other design preferences that may vary across cultures unless it is significantly similar with each other in the focus group. This finding also supports a general call for localization of selected web objects and provides some directions related to specific cultural preferences in web design. As many researchers have pointed out, localization goes far beyond translation to include layout, symbols, navigation, and use of color. The information in this investigation provides some guidelines for web designers and web managers on how to create sites that are culturally appropriate. Further, it would be expected to design suitable websites to contribute to the development of user loyalty and satisfaction [28, 36, 37, 38]. Therefore, appropriate designs across cultures also have the potential for commercial advantage.

To conclude, the uMMp obtained can be used as standard guidelines for designers or developers in the web UI development in the future. This is to ensure that the websites that are developed fulfill the users' expectations and are sustainable. Further studies are recommended to use other tools such as eye-tracking technologies and an online survey to confirm the results.

REFERENCES

[1] Y. Purwati. 2011. Standard Features of E-commerce User Interface for the Web. Journal of Arts, Science & Commerce, 2, pp. 77-87

[2] D. Robins, J. Holmes. 2008. Aesthetics and credibility in web site design. Information Processing & Management 44 (1), pp. 386–399.

[3] A. Marcus and E.W. Gould. 2000. Cultural dimensions and global web user interface design: What? So what? Now what? 6th International conference on human factors and the web. Austin.

[4] Robbins, Stephanie and Antonis Stylianou. 2002. A Study of Cultural Differences in Global Corporate Web Sites. The Journal of Computer Information Systems 42, 2, pp. 3-9.

[5] B. Aslina and J. Azizah. 2013a. Cultural Adaptivity for Sustainable User Interface: Investigating User Expectation on ASEAN Countries. Proceeding of The International Conference on Future Trends in Computing and Communication Engineering (FTCC), pp. 45–49.

[6] B. Aslina and J. Azizah 2013b. Users' Expectation of Web Objects Location: Case Study of ASEAN Countries, In Proceeding(s) Springer 2013 Lecture Notes In Computer Science ISBN 978-3-319- 02957-3, Advances In Visual Informatics - Third International Visual Informatics Conference, IVIC 2013, Selangor, Malaysia, pp. 383-395.

[7] Craik, K.J.W. 1999. The Nature of Explanation. Cambridge University Press, Cambridge (1943) 13. Davidson, M.J., Dove, L., Weltz, J.: Mental Models And Usability.

[8] P.N. Johnson-Laird, V. Girotto and P. Legrenzi. 1998. Mental models: a gentle guide for outsiders. Retrieved from http://www.si.umich.edu/ICOS/gentleintro.html

[9] D.A. Norman. 1983. Some observations on mental models, In D. Gentner and A.L. Stevens (Eds.), Mental models. Hillsdale, NJ: Erlbaum. pp. 7–14.

[10] S. Payne. 1991. A descriptive study of mental models. Behavior and Information Technology, 10(1), pp. 3-21.

[11] H. Adkisson. 2002. Identifying De-Facto Standards for E-Commerce Web Sites, Unpublished Master's Thesis, University of Washington, Washington: US.

[12] S. Djamasbi, M. Siegel and T. Tullis. 2010. Generation Y, web design, and eye tracking. International Journal of Human-Computer Studies, 68(5), pp. 307-323.

[13] S.P. Roth, A.N. Tuch, E.D. Mekler, J.A. Bargas-Avila and K. Opwis. 2013. Location Matters, Especially for Non-salient Features - An Eye-tracking Study on the Effects of Web Object Placement on Different Types of Websites, International Journal of Human-Computer Studies (71:3), March, pp. 228-235.

[14] M. Bernard. 2001. User expectations for the location of web objects, CHI: Conference on Human Factors in Computing Systems ACM, Seattle, Washington, pp. 171-172.

[15] M. Bernard. 2000. Examining user expectations of the location of web objects, ITG Internetworking 3.3 [Online]. Retrieved from http://www.internettg.org/newsletter/dec00/article_bernard.html

[16] M. Bernard and A. Sheshadri. 2004. Preliminary Examination of Global Expectations of Users' Mental Models for E-Commerce Web Layouts, Usability News, Vol. 6, No. 2. Retrieved from http://www.surl.org/usabilitynews/62/web_object_international.asp

[17] A.D. Shaikh, K. Lenz. 2006. Where's The Search? Re-Examining User Expectations of Web Objects, Usability News, Vol. 8, No. 1. Retrieved from http://www.surl.org/usabilitynews/81/webobjects.asp

[18] M. Bernard. 2002. Examining User Expectations for the Location of Common E-Commerce Web Objects, Usability News, vol. 4, no. 1. Retrieved December 16, 2009 from http://www.surl.org/usabilitynews/41/web_object-ecom.asp

[19] C. Costa. 2010. Cultural Factors and Usability User Expectations for the Location of E-Commerce Web Objects Case Study in Portugal.

[20] A. Al-Badi and P. Mayhew. 2004. Designers' Perspective of Website Usability: The Cultural Dimension. IADIS International Conference WWW/Internet. pp. 485-494.

[21] D. Cyr and H. Trevor-Smith. 2004. Localization of web design: An empirical comparison of German, Japanese, and United States web site characteristics. Journal of the American Society for Information Science and Technology 55 (13), pp. 1199-1208.

[22] A. Daniel, A. Oludele, R. Baguma and T. Weide. 2011. Cultural Issues and Their Relevance in Designing Usable Websites. International Journal of Innovative Technology & Creative Engineering. 1(2), pp. 20-29.

[23] J. Nantel, H. Glaser. 2008. The impact of language and culture on perceived website usability, Journal of Engineering Technology Manage, Vol. 25, pp. 112-122.

[24] K. Reinecke, Culturally Adaptive User Interfaces, Thesis, 2010.

[25] A. Oulasvirta, L. Karkkarinen and J. Laarni. 2005. Expectations and memory in link search. Computers in Human Behavior, 21, pp. 773-789.

[26] S. Roth, P. Schmutz, S. Pauwels, J. Bargas-Avila and K. Opwis. 2010. Mental models for web objects: Where do users expect to find the most frequent objects in online shops, news portals, and company web pages? Interacting with Computers, 22(2), pp. 140–152.

[27] R.N. Vasantha and N.S. Harinarayana. 2011. Identifying the Location of Web Objects: A Study of Library Websites, 8th International Caliber - 2011, Goa University, Goa, Paper presented at 8th International Caliber, pp. 28-39.

[28] W. Chin and M. Lee. 2000. On The Formation of End-User Computing Satisfaction: A Proposed Model and Measurement Instrument.

[29] E. Huizingh. 2000. The content and design of web sites: an empirical study. Information and Management. 37, pp. 123-134.

[30] S. Makri. 2004. Investigating users' mental models of traditional and digital libraries. Master Thesis. University College London.

[31] F. Moura, K. Deans and J. Gnoth. 2012. Does the Localisation of Cultural Markers Affect User's Destination image? E-Review of Tourism Research (eRTR) 10(2), pp. 39-42.

[32] A. Einstein. 1997. The Golden Rules of User Interface Design. The Elements of User Interface Design © John Wiley & Sons. Pp. 5-1 – 5-28.

[33] D. Choi, J. Kim and S. Kim. 2007. ERP training with a web-based electronic learning system: the flow theory perspective. International Journal of Human Computer Studies, 65(1), pp. 223-243.

[34] J. Nielsen. 2003. Will pain-text ads continue to rule?. Retrieved April 11, 2011 from Jakob Nielsen's Alertbox, 2003. Retrieved from http://www.useit.com/alertbox/20030428.html

[35] D. Cyr and H. Trevor-Smith. 2002. Building e-Loyalty across cultures and organizational boundaries. In N. Paulsen & T. Hernes (Eds.). Managing Boundaries in Organizations: Multiple Perspectives. London: Palgrave (McMillan).

[36] M. Gommans, K.S. Krishan and K.B. Scheddold. 2001. From brand loyalty to e-loyalty: A conceptual framework. Journal of Economic and Social Research, 3(1), pp. 43-58.

[37] S.J. Simon. 2001. The impact of culture and gender on web sites: An empirical study. The Data Base for Advances in Information Systems, 32 (1), pp. 18-37.

[38] S. Yoon. 2002. The antecedents and consequences of trust in online-purchase decisions. Journal of Interactive Marketing, 16 (2), pp. 47-63.